REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. Applicants respectfully request that the foregoing amendments be entered, at least because they narrow the issues for appeal.

Claims 7, 15, 16, 21 and 22 are requested to be cancelled without prejudice or disclaimer. Claims 1, 8, 24, 25, 27 and 29 are currently being amended. Support for the amendments to independent claims 1, 24, 25 and 27 can be found at least in original claim 7, and in the specification, for example, on page 16, lines 14-27. No new matter is being added.

This amendment changes and deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1, 3, 8, 10, 20, 24, 25 and 27-29 are now pending in this application.

Rejections Under 35 U.S.C. § 103

Claims 1, 3, 7, 8, 10, 15, 16, 20-22, 24, 25 and 27-29 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,693,203 to Ohhashi et al. (hereafter "Ohhashi") in view of applicants' alleged admission in the Rule 132 declaration filed on April 12, 2004, or U.S. Patent No. 4,720,300 to Nishizawa et al. (hereafter " Nishizawa "), and in furtherview of alleged prior art admission on page 2, lines 1-28 of the instant specification. Applicants respectfully traverse this rejection for at least the following reasons.

Independent Claim 1, as amended, recites:

A high purity Nb sputtering target for forming *a Nb liner film of an Al interconnection film having a resistivity of 4 μΩcm or less*, the high purity Nb sputtering target containing an amount of Ta and an amount of oxygen as impurities dispersed therein, the amount of Ta in the target being in a range of 550 to 3000 ppm, the amount of oxygen in the target being in a range of 10 to 200 ppm, wherein a dispersion of the Ta content in the target is within 30% , and a dispersion of the oxygen content in the target is within 80%, the dispersion of the Ta content and the dispersion of the oxygen content being respectively defined by the following equation, for respective measured content values of 9 specimens sampled at respective predetermined positions in the target:

dispersion (%) = {(maximum value - minimum value) / (maximum value + minimum value)} X 100

wherein an average grain diameter of Nb in the high purity Nb sputtering target is 100 μm or less, each grain of the Nb grains has a grain diameter in the range of 0.1 to 10 times an average grain diameter, and a grain size ratio of adjacent grains is in the range of 0.1 to 10,

wherein the high purity Nb target is formed by melting due to multiple times of EB melting so as to reduce the Ta content and oxygen content and the dispersion in a Nb ingot and by plastic working the Nb ingot with a working rate in a range of 50 to 98% and by heat-treating at a temperature in a range of 800 to 1300°C for one hour or more, and

wherein the sputtering target is bonded with a backing plate made of Al or an Al alloy by hot-pressing at a temperature in a range of 400 to 600°C.

Ohhashi fails to disclose or suggest at least the above italicized features of claim 1.

Ohhashi discloses a sputtering target made of a material selected from the group consisting of a refractory metal of W, Mo, Ti, Ta, Zr and Nb and a refractory metal-based alloys, silicides of the refractory metal, and Al, and Al alloys, and a backing plate of Cu and Cu alloys, Al and Al alloys, stainless steels and Ti and Ti alloys (col. 4, lines 61 to 67). The Patent Office cites to Ohhashi for allegedly disclosing certain features of the claims, in particular for the backing plate (col. 4, lines 65-67), Nb sputtering target (col. 4, lines 61-64) and grain size (col. 6, lines 1-20), for example.

Ohhashi, however, fails to disclose the feature of claim 1 of "wherein the sputtering target is bonded with a backing plate made of Al or an Al alloy by hot-pressing at a temperature in a range of 400 to 600°C." Ohhashi discloses a three layer sputtering target assembly composed of a sputtering target, backing plate and inserts disposed between, where

the target assembly is formed at a temperature of 150 to 350°C. (col. 5, line 63 to col. 6, line 20), or a two layer sputtering target assembly composed of a sputtering target and backing plate, the backing plate made of Ti or a Ti alloy, the target assembly being formed at a temperature of 150 to 550°C (col. 6, lines 32-48). Ohhashi, however, does not disclose a sputtering target bonded with a backing plate made of Al or an Al alloy by hot-pressing at a temperature in a range of 400 to 600°C. Thus, the sputtering target assembly as disclosed in Ohhashi is distinctly different from the sputtering target assembly of claim 1 in which the Nb sputtering target is bonded with a backing plate made of Al or an Al alloy by hot-pressing at a temperature in a range of 400 to 600°C.

Ohhashi also fails to disclose as recited in claim 1, "a high purity Nb sputtering target for forming a Nb liner film of an Al interconnection film having a resistivity of 4 μΩcm or less."

The Patent Office on page 4 of the Office Actions states:

> [w]ith respect to claimed use of the Nb sputtering target as liner material to Al, acknowledged prior art admission discloses the use of Nb as liner material to Al in the same field of endeavor or the analogous metallurgical art (Instant specification, page 2, lines 20-24). The resistivity of interconnection file of semiconductor memories is required to be 4 μΩcm or less (specification, page 2, lines 25-28). Therefore, it would have been obvious to one having ordinary skill in the art of the cited references at the time the invention was made to use Nb sputtering target as liner material and with resistivity 4 μΩcm or less as taught by acknowledged prior art admission in order to reduce the interconnection resistance and improve reflow characteristics of Al (See instant specification, page 2, lines 20-24).

The specification, however, on page 3, lines 1 to 5, states "when with a Nb film deposited by use of an existing Nb target as the liner material, thereon an Al film or Al alloy film, it is difficult to suppress the resistivity to 4 μΩcm or less with reproducibility." Further, as described on page 3, lines 6 to 11 of the specification, there was a problem that giant dusts, such as exceeding 1 μm, occur suddenly which remarkably deteriorates the product yield of the semiconductor devices. Thus, the resistivity of 4 μΩcm or less for an Al film or Al alloy film using a Nb target was not achievable with reproducibility in the prior art.

Moreover, even if a resistivity of 4 μΩcm or less was desirable, Ohhashi fails to make any suggestion on how to achieve a Nb liner film for an Al interconnection film, where the Al interconnection film has a resistivity of 4 μΩcm or less. Ohhashi is directed merely to a sputtering target itself, but not to any films formed using the target or in particular to an Al interconnection film with the resistivity recited in the independent claims. Even if the sputtering target of Ohhashi were to be used to form a Nb liner film for an Al interconnection film, Ohhashi makes no suggestion regarding how to achieve the resistivity as recited in the independent claims.

Nishizawa fails to cure the deficiencies of Ohhashi.

Independent claims 24, 25 and 27, have features corresponding to those discussed above with respect to claim 1, and are patentable for analogous reasons.

The dependent claims are patentable for at least the same reasons as their respective independent claims, as well as for further patentable features recited therein..

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorize payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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